DOCUMENT RESUME

ED 074 708 EM 010 839

AUTHOR Mullally, Lee J.
TITLE Comprehension of a Narrative Passage by Primary School Children as a Function of Listening Rate and Reading Comprehension Level.
PUB DATE 72
NOTE 110p.; Ph.D. Thesis, Michigan State University. Paper presented at the Association for Educational Communication & Technology Annual Convention (Las Vegas, Nevada, April 9-13, 1973)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Comprehension; Content Reading; Early Reading; Elementary Education; Grade 1; Grade 2; Grade 3; Listening; *Listening Comprehension; Listening Skills; Listening Tests; Readability; Reading Achievement; *Reading Comprehension; Reading Instruction; Reading Level; *Reading Research; Retention; *Speech Compression

ABSTRACT

The comprehension of a narrative passage by primary grade children as a function of both listening rate and the reading comprehension level was examined by this study. Ninety-six children divided into three groups according to reading level were used. The listening rate was controlled by means of a word compression ranging from zero (138 words per minute) to 60 percent (345 words per minute). Comprehension was measured by means of a standard test. The experiment revealed that listening comprehension declines as speech is compressed and that Grade 3 reading achievement level children scored higher in comprehension than did Grade 2 children. In addition, Grade 2 level children were higher than Grade 1 level in listening comprehension. In addition, no significant interaction between the three levels of reading achievement and the four levels of word compression rate was found. (MC)

ED 074708

COMPREHENSION OF A NARRATIVE PASSAGE BY PRIMARY SCHOOL CHILDREN AS A FUNCTION OF LISTENING RATE AND READING COMPREHENSION LEVEL

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A THESIS

Submitted to
Michigan State University
for the degree of

DOCTOR OF PHILOSOPHY

College of Education

1972

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ACKNOWLEDGEMENTS

This research study represents a cooperative effort from a number of individuals who have contributed much time toward its completion.

Special appreciation is extended to Dr. Elwood E. Miller who served as Chairman of my Guidance Committee. He provided the much appreciated advisement, guidance, and encouragement throughout the course of this study as well as throughout the doctoral program. Dr. Miller has been an inspiration to the writer.

Appreciation is extended to Dr. Curtis J. McCarty who contributed many useful suggestions for this study, especially in regard to the experimental design.

Acknowledgement is due to Dr. Daniel Jacobson who created many worthwhile experiences within my doctoral program, especially in the area of field research. His suggestions and guidance enabled the writer to experience and perform field research in addition to this experimental research study.

Appreciation is also extended to Dr. James Page who provided much assistance during the initial stages, as well as the final stages of the study.

To Dr. Witt, Institute Director, and institute participants; the research and consultation personnel from the College of Education; the graduate students in instructional development and technology; the primary grade students, reading specialists, and the principal of the school in which the study was conducted; appreciation is extended for their assistance and cooperation.

Finally, great appreciation is extended to my family. My wife, Ann, provided a great amount of assistance throughout this study. Her encouragement was very supportive. My son, John, was very understanding and considerate during my doctoral program.

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CHAPTER I

STATEMENT OF THE PROBLEM

Need

Many scholars have indicated that elementary students spend from fifty to sixty percent of their time in class to some listening activities. This mode of learning has been considered to be an inefficient method of learning because individuals assimilate materials at a much faster rate.

The trend of meeting individual differences of students has led to the alteration of modes of instruction, but very little has been done with the rates at which students see or hear the information being presented. The rate at which individuals listen while engaged in the learning process is neglected. Nichols[1] suggests that the listening channels to the brain are capable of accepting more information than what is presented through a normal word rate. The channel soon fills itself with other thoughts not necessarily pertinent to what is being heard.

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[1]Ralph G. Nichols and L. A. Stevens. Are You Listening? New York: McGraw-Hill, 1957, p. 78.

According to Woodcock and Clark,[2] thorough studies are needed in order to determine a child's performance involving a wide range of listening rates. Data is needed to determine the effectiveness of auditory learning through varying word rates for children of various age and intelligence levels. Gerald M. Goldhaber of the Communication Research Center at Purdue University indicates that his research provides "evidence that perhaps we may be able to teach via compressed speech in the early grades of both secondary and elementary education."[3] The study by Woodcock and Clark[4] indicated that listening to time compressed speech can be an effective learning medium for elementary school children.

Numerous studies have been conducted concerning the effect of compressed speech on listener comprehension. However, many of these studies involved high school students or adults, such as those conducted by Fairbanks, Guttman, and Miron.[5]

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[2]Richard W. Woodcock and Charlotte R. Clark, "Comprehension of a Narrative Passage by Elementary School Children as a Function of Listening Rate, Retention Period, and IQ." The Journal of Communication, XVIII (September, 1968), 261.

[3]Emerson Foulke, ed., "Public School Children Try Compressed Speech." CRCR Newsletter, III (January, 1969), p. 5.

[4]Richard W. Woodcock and Charlotte R. Clark, "Comprehension of a Narrative Passage by Elementary School Children as a Function of Listening Rate, Retention Period, and IQ," p. 259.

[5]G. Fairbanks, N. Guttman, and M. S. Miron, "Auditory Comprehension of Repeated High Speed Messages," Journal of Speech and Hearing Disorders, XXII (March, 1957), pp. 20-22.

Very few studies involving compressed speech have been conducted with younger children, especially primary school children. Woodcock and Clark[6] studied listening comprehension and compressed speech with young children, but their sample population consisted of low IQ sixth graders, average IQ fifth graders, and high IQ third graders. They did not include grades one or two in their study. Fergen's study[7] of comprehension and compressed speech was concerned with a sample population of grades four, five, and six.

Another characteristic of previous studies which must be considered is the method in which the narrative passages were compressed. Studies utilized various methods for altering the word rate of the narrative passage. For example, Fergen[8] did not use a sampling method but rather used an accelerated method to alter the word rate. This method can create a distortion in vocal pitch and quality. The methods of rapid speech, speaking at a faster rate; speed changing, altering speed of the record or recording tape; and sampling, discarding small samples through a Tempo Regulator or an Electro Information Rate Changer are not comparable methods for compressing speech.

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[6]Richard W. Woodcock and Charlotte R. Clark, "Comprehension of a Narrative Passage by Elementary School Children as a Function of Listening Rate, Retention Period, and IQ," p. 262.

[7]Katherine Fergen, "Listening Comprehension at Controlled Rates for Children in Grades IV, V, and VI," Dissertation Abstracts, XV (January, 1955), p. 89.

[8]Ibid., p. 89.

Purpose

This study will be concerned with seeking answers to a number of questions regarding listening comprehension by primary school children as a function of listening rate and reading comprehension achievement. Comprehension will be considered as the "ability to show a knowledge of the facts and implications of a listening selection."[9] The major question to be considered in this study will be to determine if the primary school children, those in grades one through three, can comprehend information by listening to a narrative passage which has been time compressed.

The term compressed speech has a variety of definitions. For the purpose of this study, compressed speech will refer to speech that has been accelerated by the sampling method.[10] The speed of the narrative passage is reproduced in less time than that of the original recording and the method eliminates distortions in vocal pitch and quality as may be common with accelerated or rapid speech.

Another area of concern involves the amount of listening comprehension primary children can achieve at various time compressions of the narrative passage. The determination of the level of time compression at which listening

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[9]Emerson Foulke, "Comparison of Comprehension of Two Forms of Compressed Speech," Exceptional Children, XXXIII (November, 1966), p. 172.

[10]Emerson Foulke, ed., Proceedings of the Louisville Conference on Time Compressed Speech (Louisville, Kentucky, October 19-21, 1966), p. 7.

comprehension declines will also be achieved in this study. The time compressions used in this study will be categorized according to the percent of compression of the original narrative passage. Since publications vary as to what constitutes normal word rate, the normal word rate for this study will be considered as zero percent of the original narrative passage. For instance, if the original narrative passage consists of 625 words and is read over a period of 5 minutes, the normal word rate of zero percent would be 125 words per minute.

The results of an investigation concerning listening comprehension by primary school children as a function of listening rate and reading comprehension achievement may provide another strategy or method of learning available to the primary school children. Compressed speech could become an alternate strategy for teaching.

Hypotheses

Studies of channel capacity by Miller[11] indicate that the communication channel of the listener has a finite capacity for handling information. If the amount of input information is increased beyond channel capacity, a resultant information loss occurs. If the normal speech rate is well below channel capacity, initial increases in word rate should

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[11]Emerson Foulke, ed., Proceedings of the Louisville Conference on Time Compressed Speech, p. 27.

have little effect upon comprehension. However, as the word rate begins to reach channel capacity, comprehension should begin to decline. Listening comprehension should fall rapidly as channel capacity is exceeded. Many studies dealing with adults "suggest that comprehension is a positively accelerated decreasing function of word rate."[12]

In addition to channel capacity, there is a need to investigate the interaction between speech compression rates and an individual's ability.[13]

The hypotheses to be considered in this study are as follows:

Hypothesis I--The mean score on a listening comprehension test for primary grade students at each reading achievement level will decrease as the word rate for the narrative passage is increased.

Hypothesis II--The mean score on a listening comprehension test for primary students at the higher reading achievement level will be greater than the mean score on the same listening comprehension test for students at the lower reading achievement levels at each of the word rates.

Hypothesis III--An interaction effect will result between the reading achievement level and the word rate.

Theory and Rationale

The dimensions of the study are based upon the communication act of reception. Both of the reception processes,

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[12]Ibid., p. 28.

[13]Richard W. Woodcock and Charlotte R. Clark, "Comprehension of a Narrative Passage by Elementary School Children as a Function of Listening Rate, Retention Period, and IQ," pp. 266-269.

listening and reading need to be considered as well as the word rate involved in the act of reception.

Listening and Reading

Listening and reading are said to be somewhat analogous according to Wesley Many.[14] Although the acts of reading and listening may be analogous, Nichols[15] states that listening and reading require different skills. "The spoken word is not communicated in the same manner as the written word."[16]

The relationship between reading and listening is very complex. The receiver in listening must learn to organize the spoken language and that organization is also an essential element of reading according to Hollingsworth.[17] In addition to similar thinking skills involved in both processes, individuals utilize their experiential backgrounds. Bond and Tinker[18] have indicated that the learner's entire background of experience is a factor which allows that

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[14]Wesley A. Many, "Is There Really Any Difference--Reading vs. Listening," The Reading Teacher (November, 1965), p. 110.

[15]Ralph G. Nichols and Leonard A. Stevens, Are You Listening? New York: McGraw-Hill, Inc., 1957, p. 13.

[16]Ibid., p. 56.

[17]Paul M. Hollingsworth, "Can Training in Listening Improve Reading?" In Reading Instruction, ed. by William K. Durr (Boston: Houghton Mifflin Co. 1967), p. 139.

[18]Guy L. Bond and Miles A. Tinker. Reading Difficulties: Their Diagnosis and Correction. New York: Appleton-Century-Crofts, Inc., 1967, p. 271.

learner to arrive at specific word meanings. This, along with the learner's capability of language usage for the purposes of communication are necessary factors for developing word meanings. The perception of words and their meanings lead to comprehension.

Those processes involved in comprehending printed material and in understanding spoken words are basically tne same. "During the primary grades, while pupils are in the process of mastering the mechanics of reading, listening comprehension tends to be superior to reading comprehension."[19] Children have been developing listening comprehension since their birth. "Children are expected to spend more time in listening than in any other single activity in the elementary school."[20] Bond and Tinker[21] report a child at the first grade level would normally hear more "running words" in two days than he would read in the entire first grade. This may be further supported by Ducker[22] and others who state that the first grader is a better listener than reader and his listening comprehension is equal to or better than reading comprehension. There is approximately a "six-year lag of

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[19]Ibid., p. 272.

[20]Miriam Wilt, "A Study of Teacher Awareness of Listening as a Factor in Elementary Education." Journal of Educational Research, XLIII (April, 1950), p. 633.

[21]Guy L. Bond and Miles A. Tinker, Reading Difficulties, p. 272.

[22]Sam Ducker, "Listening and Reading," The Elementary School Journal, LXV (March, 1965), p. 327.

reading comprehension behind listening comprehension"[23] for that individual as he begins grade one. As the child matures and progresses through the upper grades, his reading proficiency increases and his reading comprehension gets its opportunity to become superior to listening comprehension. Furthermore, Many[24] indicates that the child in the upper grades, such as a sixth grade child, comprehends better through the visual mode or reading than he does through listening.

Children in the primary and intermediate grades prefer to listen rather than read, when offered a choice according to Taylor.[25] However, students are instructed in the area of reading more than they are in the listening area. Children will leave school and enter society where they will listen to three times as much as they read. Listening and listening comprehension need to be stressed more in the learning process. "In the primary grades, the listening program is an important aid to reading comprehension."[26]

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[23]Guy L. Bond and Miles A. Tinker, Reading Difficulties, p. 272.

[24]Wesley A. Many, "Is There Really Any Difference--Reading vs. Listening?" p. 113.

[25]Stanford E. Taylor, Listening, Vol. XXIX of What Research Says to the Teacher (Washington, D. C.: National Education Association, April, 1964), p. 16.

[26]Paul M. Hollingsworth, "Can Training in Listening Improve Reading?" p. 139.

Word Rate

The average listener is exposed daily to speaking rates ranging from about 125 to 175 words per minute. The lower limits of this range are easily handled by the human brain and Nichols[27] states that people can listen to spoken words at a much faster rate.

> Theoretically, many more spoken words per minute could be understood, but there's a limit to the speed at which words can be formed orally without a mechanical distortion resulting in unintelligibility.[28]

It has been found that individuals can comprehend speech at approximately 300 words per minute without experiencing a significant loss from that material which can also be comprehended at slower rates.

> In the act of listening the differential between thinking and speaking rates means that our brains work with hundreds of words in addition to those we hear, assembling thoughts other than those spoken to us.[29]

Taylor[30] suggests that the less competent student has a preference for listening over reading in most learning situations and does retain more from listening. Combining this notion with information revealed as early as 1940 by Goldstein,[31]

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[27]Ralph G. Nichols and Leonard A. Stevens, Are You Listening? p. 78.

[28]Ibid.

[29]Ibid., p. 79.

[30]Stanford E. Taylor, Listening, p. 17.

[31]Harry Goldstein, "Reading and Listening Comprehension at Various Controlled Rates," Teachers College, Columbia University: Contributions to Education, No. 821 (New York: Bureau of Publications, Teachers College, Columbia University, 1940), p. 55.

which indicated a positive correlation between reading rate and the ability to comprehend accelerated speech, one could attempt to provide alternative methods for communicating through the receptive act.

This study is concerned with the receptive act of listening through the use of various word rates, or speech compressions. Determining the feasibility of using reading achievement level as a predictor for listening and comprehending compressed speech in the primary grades will be considered. Primary school children should also be afforded the opportunity to listen to faster word rates if they are capable of comprehending the information being presented.

Overview

The literature related to compressed speech will be reviewed in Chapter II. The literature involving the age level of the students, the sampling method for compressing speech, listening comprehension and the various word rates employed in previous studies will be discussed. In Chapter III, procedures needed to accomplish the study will be described. Preparation of the materials used in the study, selection of children for the experiment, presentation of materials, and the testing procedures and the data collection methods will be explained. An analysis of the data will be the major focus within Chapter IV.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Studies involving the relationship between listening and reading will be discussed as they pertain to this study. As this study involves the use of compressed speech, the method by which the narrative passage is compressed and studies relating to that method will also be discussed. Finally, studies relating to listening comprehension as a function of the variables being examined in this study, namely reading comprehension achievement level and word rates will be presented.

Studies Related to Listening and Reading

The importance of listening in the earlier years of a child's elementary school experience has been demonstrated through numerous studies. For instance, Wilt's[1] study revealed that children in the elementary school spend more time in listening activities than in any other single

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[1]Miriam E. Wilt, "A Study of Teacher Awareness of Listening as a Factor in Elementary Education." Journal of Educational Research, XLIII (April, 1950), p. 636.

activity. She has indicated that a greater emphasis need be placed upon the role of listening in the learning process.

Many studies have been concerned with listening abilities. Hampleman[2] has discovered that listening comprehension was significantly greater than reading comprehension. His study involved presenting materials to fourth and sixth grade children, both visually and orally. As a result of her study, Condon[3] concluded that listening was positively related to reading. Her study did indicate that listening test scores increased with a student's age. Baldauf's[4] study investigated the relationship between school achievement and listening ability for fifth grade students. He did find a correlation between school achievement and listening. Numerous studies have implied that a high correlation exists between the reading and listening processes. "Both abilities rest upon intellectual, sensory, and environmental factors."[5]

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[2]Richard S. Hampleman, "Comparison of Listening and Reading Comprehension Ability of Fourth and Sixth Grade Pupils." Dissertation Abstracts, XV (September, 1955), pp. 1757-58.

[3]Edwyna Forsyth Condon, "An Analysis of the Differences Between Good and Poor Listeners in Grades 9, 11, and 13." Dissertation Abstracts, XXVI (October, 1965), p. 3106.

[4]Robert J. Baldauf, "A Study of a Measure of Listening Comprehension and Its Relation to the School Achievement of Fifth Grade Pupils." Dissertation Abstracts, XXI (April, 1961), pp. 2979-2980.

[5]Donald D. Durrell, "Listening Comprehension vs. Reading Comprehension." Journal of Reading, XII (March, 1967), p. 455.

Budoff and Quinlan[6] conducted a study involving the presentation of word pairs to second grade children. These word pairs were presented aurally and visually in order to determine which mode was best suited for learning. It was found that the second grade children learned the word pairs which were presented aurally more quickly than the visually presented word pairs.

> The results of this study strongly suggest that aural learning among primary grade children seems more rapid and efficient than learning via a visual presentation with meaningful materials. This finding is in agreement with the conclusions reported by McGeoch and Irion.[7]

Durrell[8] has indicated that listening vocabulary is much superior to a child's reading vocabulary in the primary grades. Information is acquired more easily through the broader channel of listening than it can be through reading because the reading skills are more immature for the primary grade student. Not only is the listening vocabulary superior for the primary grade child, the listening comprehension of longer language units is also superior to reading comprehension of longer language units for the primary grade child. As the child reaches the middle grades, such as grade six, reading comprehension becomes higher than the listening comprehension.

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[6]Milton Budoff and Donald Quinlan, "Auditory and Visual Learning in Primary Grade Children." Child Development, XXXV (June, 1964), p. 583-586.

[7]Ibid., p. 586.

[8]Donald D. Durrell, "Listening Comprehension vs. Reading Comprehension," p. 457.

As Wood[9] indicated, listening has been considered to be an inefficient way of learning as people can assimilate information at a much faster rate than is normally presented in spoken form. People can speak at a faster rate but a certain amount of the speech becomes distorted as the rate is increased. Goldstein[10] attempted to study the listening comprehension of individuals as the rate of presentation was increased. His method of increasing the word rate was accomplished by changing the speaking rate and the rate of a phonograph recording, but a resultant change in pitch occurred. Various methods for increasing word rates are now available to the listener.

Sampling Method of Controlling Word Rate

Although a number of techniques exist for controlling word rate, only the sampling method will be discussed in detail as it is the method used in this study. Speaking rapidly and the speed changing method have been used in other studies but as previously mentioned they are not comparable to the sampling method. For instance, distortion in vocal pitch and quality is inherent in the speed changing method

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[9]David C. Wood, "Comprehension of Compressed Speech by Elementary School Children." Dissertation Abstracts, XXVII (July, 1966), p. 336-A.

[10]Harry Goldstein, "Reading and Listening Comprehension at Various Controlled Rates." Contributions to Education, No. 821. New York: Teachers College, Columbia University, 1940, p. 56.

whereas the sampling method eliminates most distortion.[11]

The sampling technique, having its beginning in the early 1950's, is a method which can time-compress speech without distortion in vocal pitch. Garvey's[12] experiments provided evidence that distortion would not result from this method, but his manual method for removing small samples and splicing the tape ends together was not a practical method for time-compressing speech. He discovered a 10 percent loss in intelligibility of words compressed 60 percent in time, using the manual sampling method as compared to a 40 percent intelligibility loss of words compressed 33 percent in time, using the speed changing method.

More practical techniques for time-compressing speech through the sampling method were later introduced according to Foulke.[13] For instance, the Fairbanks apparatus for time compression or expansion of recorded speech was described by Fairbanks, Everitt, and Jaeger in 1954. The Graham compressor was based upon the Fairbanks design. Springer also relied upon the basic principle of sampling to construct another modified version of the speech compressor.

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[11]Emerson Foulke, "Comparison of Comprehension of Two Forms of Compressed Speech." Exceptional Children, XXXIII (November, 1966), p. 170.

[12]W. D. Garvey, "The Intelligibility of Speeded Speech," Journal of Experimental Psychology, XLV (February, 1953), pp. 102-108.

[13]Emerson Foulke, "Methods of Controlling the Word Rate of Recorded Speech," The Journal of Communication, XX (September, 1970), p. 308.

The sampling method capitalizes on the redundancy in the spoken language. This method mechanically discards segments of the spoken language that are so brief that their absence cannot be detected. Removing brief segments of words and/or pauses between words reduces the original recording time. Most compression devices make use of recording heads which are mounted on a cylinder, which rotates as the tape passes over them, thereby making contact with the tape at preselected intervals and durations. The frequency with which tape segments are eliminated determine the amount of speech compression, according to Foulke, Amster, Nolan and Bixler.[14]

Studies involving listening comprehension through the use of the sampling method have been conducted by many individuals. In general these studies have shown a slight decline in listening comprehension after moderate compression by the sampling method, but "the superiority of the sampling method becomes more apparent at faster word rates."[15] McLain[16] also reported that the mean score of a group of high school

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[14] Emerson Foulke et al., "The Comprehension of Rapid Speech By the Blind." Exceptional Children, XXIX (November, 1962), p. 134.

[15] Emerson Foulke, "Comparison of Comprehension of Two Forms of Compressed Speech," p. 172.

[16] Julie Rhinehard McLain, "A Comparison of Two Methods of Producing Rapid Speech," International Journal for the Education of the Blind, XII (December, 1962), pp. 40-43.

students listening to compressed speech at 325 words per minute via the sampling method was higher than the mean score for a comparable group of high school students listening to compressed speech at 325 words per minute via the speed changing method.

Studies Related to Speech Compression

This section will discuss the literature and those studies as they pertain to compressed speech and the variables involved in this study.

Word Rate

Studies by Fairbanks et al., Foulke et al., Foulke and Sticht, and others have stated that "comprehension, as indicated by test scores, decreases as word rate or the amount of compression is increased."[17] Sticht,[18] using a normal word rate of 175 wpm indicated that comprehension declined only slightly as the word rate was increased to 275 wpm but then comprehension declined rapidly. He also indicated that rates between 275 and 300 wpm may be rates at which channel

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[17]Emerson Foulke and Thomas G. Sticht, "A Review of Research on Time Compressed Speech," in Proceedings of the Louisville Conference on Time Speech, ed. by Emerson Foulke (Louisville: Center for Rate Controlled Recordings, 1966), p. 12.

[18]Thomas G. Sticht, "Some Relationships of Mental Aptitude, Reading Ability, and Listening Ability Using Normal and Time Compressed Speech," Journal of Communication, XVIII (September, 1968), p. 250.

capacity begins to be exceeded. "When channel capacity is exceeded, some of the input cannot be recovered at the output."[19] Another way of stating this, according to Foulke,[20] is that the listener has been deprived of the necessary processing time required to encode the specific information when listening to word rates beyond 275 wpm. Woodcock and Clark[21] indicated that a decline in comprehension occurred rapidly after 278 wpm or approximately 63 percent of the original time for those elementary children having low to average IQ's in their study. Other "studies show that assuming an original, uncompressed word rate of approximately 175 wpm, comprehension of connected discourse begins to decline rapidly when messages are compressed to approximately 60 percent or less of their original duration."[22]

An agreement as to the rate at which comprehension declines has not been reached. Langford[23] indicated that

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[19]Emerson Foulke and Thomas Sticht, "Review of Research on the Intelligibility and Comprehension of Accelerated Speech," Psychological Bulletin, LXXII (July, 1969), p. 60.

[20]Emerson Foulke, ed., "Comprehension of Time Compressed Speech," Center for Rate Controlled Recordings Newsletter, III (January 15, 1969), p. 4.

[21]Richard W. Woodcock and Charlotte R. Clark, "Comprehension of a Narrative Passage by Elementary School Children as a Function of Listening Rate, Retention Period, and IQ." Journal of Communication, XVIII (September, 1968), p. 261.

[22]Emerson Foulke, ed., "Comprehension of Time Compressed Speech," p. 3.

[23]Robert P. Langford, "The Effect of Time Compressed Speech on Listening Comprehension." Dissertation Abstracts, XXIX (August, 1968), p. 411-A.

there was not a significant loss in comprehension when the high school juniors in his study reached word rates between 275 and 325 wpm, which is approximately 64 to 54 percent of their original duration. Orr[24] noted that normal college students can comprehend material presented at about 300 wpm with only a slight loss in comprehension. This idea was also supported by Jester's[25] study which implied that comprehension changed very little as the rate of presentation was increased up to 300 wpm. Wood[26] concluded that "at rates as high as 350 wpm, children exceeded 90 percent comprehension, and at no rate was the level less than 75 percent." Using his normal word rate of 175 wpm, this indicates that children can comprehend at rates which are approximately 50 percent of their original duration.

Others have indicated that the rates at which individuals can comprehend information through compressed speech is lower than the previously mentioned 275 wpm. For instance, Rossiter[27] discovered a decline in comprehension at a rate

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[24]David B. Orr, "A Note on Rapid Listening." Phi Delta Kappan, XLVI (May, 1965), p. 460.

[25]R. Jester, "Comprehension of Connected Meaningful Discourse as a Function of Individual Differences and Rate and Modality of Presentation." Dissertation Abstracts, XXVII (October, 1966), p. 957.

[26]David C. Wood, "Comprehension of Compressed Speech by Elementary School Children." Dissertation Abstracts, XXVII (July, 1966), p. 336-A.

[27]Charles M. Rossiter, "Rate-of-Presentation Effects on Recall on Facts and of Ideas and on Generation of Inferences." AV Communication Review, XIX (Fall, 1971), pp. 313-24.

of 233 wpm. He did, however, use only small messages of about one and one-half minutes in length in measuring comprehension. Much of this short type of message could easily be missed and account for a decline in comprehension. In a HUMRO report[28] it was noted that a decrease in learning results with speech rate less than 275 wpm. However, the report also expressed the belief that learning will decline at much slower rates, such as those below 175 wpm. Therefore, the relationship between learning and rates which are extremely slow or extremely fast may take on the form of an inverted U. (see Figure 1). Sticht did state that "adequate data is not now available to describe empirically the relationship between speech rate and learning by listening."[29]

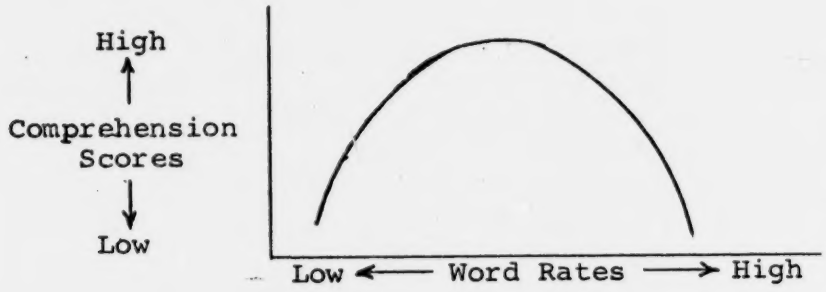

Figure 1. Comprehension and word rate relationships.

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[28]Thomas G. Sticht, "Learning by Listening." Prepared for C.O.B.R.E. Research Workshop on Language Comprehension and the Acquisition of Knowledge (Rougemont, North Carolina: HUMRO, March, 1971), p. 28.

[29]Ibid., p. 27.

Some studies have pertained to listening preferences for word rates. These studies have shown that preferences are more toward the rates of between 175 wpm and 200 wpm[30] or more specifically toward 207 wpm which, according to Foulke and Sticht,[31] is a rate well above those rates typically reported in most of the related literature. It should be noted that the original recording for the preferred rate of 207 wpm was done at 175 wpm. The studies involving preferred listening neglect to indicate the relationship to the preferred word rates and the most effective word rates for learning.

Age Levels

Many compressed speech studies of the past have been concerned with adults or older children. Many studies have been done with adults, such as Barabasz's[32] study which indicated that increases of up to one-third of the word rate did not have any significant loss in recall of information for those college students involved in the study.

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[30]Charles F. Diehl, Richard C. White, and Kenneth W. Burk, "Rate and Communication." Speech Monographs, XXVI (August, 1959), p. 232.

[31]Emerson Foulke and Thomas G. Sticht, "Listening Rate Preferences of College Students for Literary Material of Moderate Difficulty." Journal of Auditory Research, VI (1966), pp. 397-401.

[32]A. Barabasz, "A Study of Recall and Retention of Accelerated Lecture Presentation." Journal of Communication, XVIII (September, 1966), pp. 283-287.

Orr, Friedman and Williams[33] and Foulke and Sticht[34] also used college age subjects. High school age students have also been subjects for many comprehension studies involving compressed speech, as in Langford's[35] study. Foulke[36] reported that Goldhaber conducted a study involving the comparison of comprehension scores between junior high school students and college freshman. Using word rates of 175, 250, and 325 wpm, Goldhaber indicated that the junior high school students had results which were significantly higher than those of the college freshman.

Very few compressed speech studies of the past have related to younger children, especially those at the primary grade school level. As previously mentioned, Fergen[37] and

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[33]D. B. Orr, H. L. Friedman, and Jane C. Williams, "Trainability of Listening Comprehension of Speeded Discourse," Journal of Educational Psychology, LVI (June, 1965), pp. 148-156.

[34]Emerson Foulke and Thomas G. Sticht, "The Intelligibility and Comprehension of Time Compressed Speech," in Proceedings of the Louisville Conference on Time Compressed Speech, ed. by Emerson Foulke (Louisville: Center for Rate Controlled Recordings, 1966), pp. 21-28.

[35]Robert P. Langford, "The Effect of Time Compressed Speech on Listening Comprehension," p. 411-A.

[36]Emerson Foulke, ed., "Public School Children Try Compressed Speech." Center for Rate Controlled Recordings Newsletter, III (January 15, 1969), p. 5.

[37]Katherine G. Fergen, "Listening Comprehension at Controlled Rates for Children in Grades IV, V, and VI." Dissertation Abstracts, XV (January, 1955), p. 89.

Woodcock and Clark[38] studied the effects of comprehension as a function of word rate using subjects at the elementary grade level. Their studies pertained to many different variables, especially the method for altering word rate. Fergen used the accelerated speech method and Woodcock and Clark used the sampling method. As indicated by Foulke,[39] very few compressed speech materials are available for use with children as young as the children at the primary grade level.

Wood,[40] however, studied the effects of rate of presentation, grade level in school, intelligence, and the amount of practice on the comprehension of compressed speech for subjects in grades one, three, and five. Although his study did include grades one and three, he did not include the remaining primary grade, namely grade two. Another factor to be considered in Wood's study is that the base word rate was 175 wpm, a rate considered to be normal in many studies. However, there is much discrepancy as to what constitutes normal word rate, according to Foulke.[41] He found a standard

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[38]Richard W. Woodcock and Charlotte R. Clark, "Comprehension of a Narrative Passage by Elementaty School Children as a Function of Listening Rate, Retention Period, and IQ," pp. 259-271.

[39]Emerson Foulke, Audio tape Correspondence, Perceptual Alternatives Laboratory (University of Louisville, Louisville, Kentucky, January 4, 1972).

[40]David C. Wood, "Comprehension of Compressed Speech by Elementary School Children," p. 336-A.

[41]Emerson Foulke and Thomas G. Sticht, "A Review of Research on Time Compressed Speech," p. 7.

deviation of 23.53 words between the speaking rates of a number of professional oral readers. Finally, it should be noted that comprehension was determined by responses to a command in the sentence in Wood's study. The children did not listen to a narrative passage and respond to questions pertaining to a specific passage.

Predictor Variables

Past studies have also varied as to what might be utilized as a predictor variable in addition to the stimulus factor of word rate. A listener variable studied by many, including Orr, Friedman, and Williams[42] was that of the listener's sex. Sex was not found to cause differences in listening comprehension for those listening to word rates ranging from 174 to 475 wpm.

Another listener variable which has been considered by many is that of intelligence. Agreement as to the relationship of intelligence and listening comprehension of compressed speech has not been reached. Fergen[43] indicated that IQ was related to listening comprehension but the relationship isn't substantial enough to use it as a predictor of listening comprehension. This implication is also

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[42]David B. Orr, Herbert L. Friedman, and Jane C. Williams, "Trainability of Listening Comprehension of Speeded Discourse," pp. 148-156.

[43]Katherine G. Fergen, "Listening Comprehension at Controlled Rates for Children in Grades IV, V, and VI," p. 89.

supported by Foulke and Sticht.[44] Wood[45] also indicated that IQ was not statistically significant to the comprehension of compressed speech.

The type of material and difficulty level of subject matter has also been a variable which has recently been considered. George[46] did not find the difficulty level to be significant in his study. He did, however, find a significant interaction between difficulty level and the retention level. Ernest[47] also examined the type of material presented and its relationship to the rate of presentation. She did find that a relationship existed between the difficulty level of the speech and its degree of abstractness or concreteness but she didn't find that listening comprehension was significantly affected by the rate of presentation.

Finally, academic achievement is a variable which has been studied as it relates to listening comprehension of compressed speech. Ernest[48] indicated that a positive

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[44]Emerson Foulke and Thomas G. Sticht, "A Review of Research on Time Compressed Speech," pp. 15-16.

[45]David C. Wood, "Comprehension of Compressed Speech by Elementary School Children, p. 336-A.

[46]Robert Glen George, "Retention of Prose Material as a Function of Rate of Presentation and Difficulty of Material." AV Communication Review, XVIII (Fall, 1970), pp. 291-99.

[47]Carole H. Ernest, "Listening Comprehension as a Function of Type of Material and Rate of Presentation." Speech Monograph, XXXV (June, 1968), p. 157.

[48]Ibid., p. 158.

relationship exists between academic achievement and listening comprehension. She did indicate, however, that the relationship which existed was dependent upon the difficulty level of the material. "The relationship between listening comprehension and academic achievement is more predictable when the material presented is well within the ability range of the subjects."[49] Goldhaber[50] investigated the rate of presentation and academic level of the subjects and found the main effect of rate and academic level to be significant. Within the area of academic achievement, studies specifically involving reading achievement have been conducted. Harwood's[51] study set out to determine if readability could be a consistent predictor of listenability at different rates for tenth grade subjects. It was stated that "readability might be used as a gross predictor of listenability."[52] A recent study by Gropper[53] revealed a relationship between listening

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[49] Ibid.

[50] Gerald M. Goldhaber, "Listener Comprehension of Compressed Speech as a Function of the Academic Grade Level of the Subjects." Journal of Communication, XX (June, 1970), pp. 167-73.

[51] Kenneth A. Harwood, "Listenability and Rate of Presentation." Speech Monograph, XXII (March, 1955), pp. 57-59.

[52] Ibid., p. 59.

[53] Robert L. Gropper, "Comprehension of Narrative Passages by Fourth-Grade Children as a Function of Listening Rate and Eleven Predictor Variables" (Unpublished Ph. D. dissertation, George Peabody College for Teachers, 1969), p. 3.

comprehension and reading achievement level as measured by the Metropolitan Achievement Test.

Summary

Literature reveals that a relationship exists between reading and listening. Listening skills appear to be greater during the early years of an individual's education, such as in the primary grades. However, reading skills improve and exceed listening skills as an individual reaches the middle or intermediate grades, such as the sixth grade. Listening is an important part of a primary grade student's learning activities.

Studies relating to listening comprehension as a function of word rate have been conducted as early as 1940, however, the major portion of these studies have been conducted only within the past decade. It was during this time that methods of altering word rate were improved, such as the sampling method for compressing speech. Past studies have also indicated that listening comprehension is not significantly affected until word rates reach or exceed 60 percent of the original time.

Various studies have attempted to predict an individual's listening comprehension of compressed speech. Disagreement has resulted among many researchers using predictors such as sex, intelligence, or type of material. Some have found that a student's achievement level can be used as a predictor for listening comprehension of compressed speech.

The related literature suggests that listening comprehension, word rates, and student's achievement levels need to be further studied. The limited studies involving primary grade children indicate that further studies need to be conducted with those subjects.

CHAPTER III

DESIGN OF THE STUDY

A description of the sample, measures employed within the study, stimulus material, procedures, and the testable hypotheses will be contained within Chapter III. The experimental design and data analysis model will also be described within this chapter.

Sample

The subjects within this study were selected from a primary grade level population within a midwestern city of 47,540. The age level of the students ranged from 6 years to 10 years of age. Both male and female subjects were involved in this study. The subjects came from a high socio-low economic population. These subjects were enrolled in an elementary school which serves a major part of the married students at a large midwestern university. Therefore, the low economic characteristic for this population is unlike most typically described low-economic populations.

One criterion for selecting the subjects for this study was reading achievement level based upon the Stanford Achievement Test. Of a population of 172 primary grade level

students attending the elementary school, a sample of 120 students having a reading achievement level ranging from 1.0 to 3.9 was selected from grades one through three, or the primary grade level. The reading achievement levels consisted of a low reading achievement group, 1.0 to 1.9 grade equivalency; 2.0 to 2.9 grade equivalency; and a high reading achievement level, 3.0 to 3.9 grade equivalency.

Additional criteria were used for selecting the sample, such as the subjects hearing abilities. Health records revealed that the subjects who were selected possessed normal hearing. Another criterion to be considered was the subject's prior experience with compressed speech. None of the subjects selected for this study had previous experience with compressed speech. Another consideration taken into account was the prior knowledge of the narrative passage. Students were selected who had not read the story prior to the study. A number of students could not be a part of this study as they had previously read the passage selected for the study.

Measures

Reading Comprehension Level

The reading comprehension level was based upon the Stanford Achievement Test, Primary I Battery and Primary II Battery. "Reading is measured by means of three tests--word reading, paragraph meaning, and word study

skills."[1] The word reading section of the test measures the student's ability to analyze words without the aid of context. The paragraph meaning test measures a child's ability to comprehend connected discourse and it measures his ability to comprehend information from simple recognition to making inferences from related sentences. Word study skills consists of measuring auditory perception and phonetic skills. The mean grade equivalency for the three areas determined each subjects reading achievement level.

The reliability for the Stanford Achievement Test: Primary Battery I[2] and Primary Battery II[3] subtests used in this study can be found in Table I. The reliability coefficients are reported as split-half reliability coefficients corrected by the Spearman Brown Prophecy Formula.

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[1]Truman L. Kelley et al., Stanford Achievement Test: Primary I Battery (New York: Harcourt, Brace and World, Inc., 1964), p. 4.

[2]Ibid., p. 30.

[3]Truman L. Kelley et al., Stanford Achievement Test: Primary II Battery (New York: Harcourt, Brace and World, Inc., 1964), p. 30.

Table 1

RELIABILITY COEFFICIENTS FOR SUBTESTS
IN PRIMARY BATTERY I AND PRIMARY BATTERY II

Subtest	Grade 1	Grade 2	Grade 3
Word Reading	.85	.85	.87
Paragraph Meaning	.90	.93	.93
Word Study Skills	.88	.92	.94

Readability Level of Passage

Studies measuring comprehension of information from given material must have some measure of readability for that given material. This study utilized the Flesch[4] readability formula which not only considers the reading ease but also considers the human interest level of the story. It was necessary to determine whether students in the primary grades could understand the vocabulary words and the sentences within the selected story. It was also considered desirable to select a story which would be highly interesting to those children in the primary grades.

The Flesch readability formula for measuring "reading ease"[5] considers the number of syllables per 100 words, which

[4]Rudolf Flesch, "A New Readability Yardstick." Journal of Applied Psychology, XXXII (June, 1948), pp. 221-33.

[5]Ibid., p. 228.

constitutes word length, and the average sentence length as they apply to the predetermined, constants within the formula. The reading ease for the selected story, Johnny Appleseed[6] (see Appendix A), was 98.298. According to Flesch's index,[7] the selected story is classified as being "very easy." For a more detailed explanation of the readability formula for measuring reading ease and the classification system of reading ease, see Appendix B.

Determining the interest level of the selected story was accomplished through the use of the Flesch readability formula for measuring "human interest."[8] It was necessary to calculate the percentage of personal words and the percentage of personal sentences found within the selected story. These percentages were then applied to the predetermined constants within the human interest formula. The human interest index for the story, Johnny Appleseed, was 48.96. According to Flesch's classification,[9] the story was considered to be "very interesting." A detailed description of the formula for measuring human interest is contained in Appendix B.

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[6]Theodore Clymer and Patricia Miles Martin, "Johnny Appleseed." The Dog Next Door and Other Stories (Boston: Ginn and Company, 1969), pp. 108-114.

[7]Rudolf Flesch, "A New Readability Yardstick," p. 230.

[8]Ibid.

[9]Ibid.

Comprehension Test

The comprehension test for the narrative passage was constructed from comprehension questions contained within the teacher's edition of The Dog Next Door and Other Stories.[10] The questions were somewhat revised in order that they would be in multiple choice format. Past studies have utilized the multiple choice format in measuring the listening comprehension of the subjects.

An initial test containing 33 questions was constructed. The test was then administered to a pilot group of children who possessed similar characteristics as those subjects involved in the study. The pilot group consisted of 16 children, 8 who listened to the narrative passage of Johnny Appleseed and then took the 33 item test and 8 who took the test without listening to the narrative passage. Both sets of tests were then scored and analyzed.

As a result of the analysis, 10 items were discarded because of their inability to differentiate between those who listened to the passage and those who did not listen to the passage. There were 8 items that were discarded because of their ambiguity. The ambiguous items were those questions having a high degree of error for both groups and the difference between the scores was slight, such as a raw score of 4 or less and a differential of 2.

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[10]Theodore Clymer and Patricia Miles Martin, The Dog Next Door and Other Stories (Boston: Ginn and Company, 1969), pp. 189-90.

Of the 15 remaining items, 12 were selected for the listening comprehension test. The reading specialists of the school at which the study was conducted assisted in the selection of the 12 items. The basis for selecting the test questions was ability to differentiate, clarity of the question, and in some cases, the ease of answering the question. It was suggested that the inclusion of some easy questions may reduce the possibility of creating frustrations for those listening to greater speech compressions. In other words, a sense of accomplishment would be assured if the test included some questions which could be answered by many students.

The listening comprehension test consisted of six questions pertaining to the people in the story, such as Johnny Appleseed, the farmer, or the men at the mill. The remaining six questions pertained to things Johnny Appleseed saw, heard, or wore. The subjects were read the test questions and possible answers for each question by the examiner. The subjects circled a picture to represent their answer for each question. An example of the listening comprehension test and answer sheet can be found in Appendix C. The reliability of the comprehension test, as determined by the Kuder Richardson Reliability #20, was .7741.

Stimulus Material

Directions for Listening

Students were given directions for listening to the narrative passage through the use of audio tape. The student directions were divided into three sections.

First, the students were given directions pertaining to the volume level of the audio tape. They were instructed to raise their hand if they could hear the narrator's voice well. They were also informed that the voice of the narrator may sound different and they would hear an example of the narrator's voice as it would sound in the narrative passage. These directions were presented to the students at the normal word rate used in this study or a compression of 100 percent of the original time.

Secondly, the students were exposed to a sample of the narrator's voice as it would sound in the narrative passage. In this section of the directions, the students were informed that they would be asked some questions relating to the narrative passage. They were also informed that the voice should sound similar to that which they were listening. This section of the directions was the same time compression as the narrative passage it superseded. For example, if the narrative passage was compressed 40 percent of the original time, the second section of the directions would also be compressed 40 percent of the original time. The total length of this section involved 53 words and was read in less than

24 seconds for the 0 percent compression and less time for the higher compressions.

It should be noted that the second section was designed to familiarize the subjects with compressed speech and was not used for training purposes. Voor and Miller[11] and Orr, Friedman, and Williams[12] did indicate that individuals could be trained in listening to compressed speech. However, their studies involved listening to compressed speech over greater amounts of time, such as several hours spread over a week and lasting up to several weeks. Foulke and Sticht[13] concluded that simple exposure to compressed speech would not be an adequate training experience for improving listening comprehension of time compressed speech.

Finally, the third section of the directions summarized what the subjects were to expect and to reassure the children that the narrator's voice would sound different. This section was presented at the normal word rate or 100 percent of the original time to all subjects.

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[11]John B. Voor and Joseph M. Miller, "The Effect of Practice Upon the Comprehension of Time-Compressed Speech." Speech Monographs, XXXII (August, 1965), pp. 452-454.

[12]David B. Orr, Herbert L. Friedman, and Jane C. Williams, "Trainability of Listening Comprehension of Speeded Discourse." Journal of Educational Psychology, LVI (June, 1965), pp. 148-156.

[13]Emerson Foulke and Thomas G. Sticht, "A Review of Research on Time Compressed Speech," in Proceedings of the Louisville Conference on Time Compressed Speech, ed. by Emerson Foulke (Louisville: Perceptual Alternates Laboratory, 1966), p. 18.

Narrative Passage

In addition to the directions for listening, the narrative passage, Johnny Appleseed, was read and recorded by a professional reader from the Perceptual Alternatives Laboratory at the University of Louisville, Louisville, Kentucky. As Beighley[14] indicated, comprehension was higher when skilled speakers were used instead of unskilled speakers. The narrative passage of 622 words was read in a time of four minutes and thirty seconds or at a rate of 138.2 words per minute. For the purpose of this study, the normal word rate will be considered as 138 wpm or 100 percent of the original time. The word rates and percentages of compression for the passage can be found in Table 2.

Table 2

WORD RATES FOR JOHNNY APPLESEED

Words Per Minute	Percent Compression
*138	0
173	20
230	40
345	60

*The base or "normal" word rate for this study.

[14]K. Beighley, "An Experimental Study of the Effect of Four Speech Variables on Listener Comprehension." Dissertation Abstracts, XVIII (May, 1958), p. 1896.

A sample of listening comprehension audio tapes, available to the primary grade level children, were selected in order to determine the base word rate. It was determined that the mean word rate for the sampled audio tapes was 125 wpm. In order to prevent the narrative passage from being read unnaturally, it was necessary to establish an acceptable deviation in reading time. The suggested or desired reading time was five minutes, or approximately 125 wpm, and the acceptable deviation was four minutes and thirty seconds or 138 wpm.

The original recording was compressed 100 percent of the original time and became the normal word rate narrative passage. The original recording of the narrative passage was also compressed 80, 60, and 40 percent of the original time. The time compressions were accomplished through the use of the sampling method on the Tempo Regulator at the Perceptual Alternatives Laboratory.

The original recording was divided into the four time compressions. Each time compression was professionally duplicated onto 3M, high energy, audio cassettes in order to facilitate the testing procedures. Each cassette contained the directions for listening and the narrative passage in compressed form, either 0, 20, 40, or 60 percent compression. The audio cassettes were then played back and checked for accuracy with respect to the narration and length of playing time.

Procedures

The subjects received the treatment in a separate, carpeted room adjoining one of the classrooms. The room contained two tables, onto which were placed portable carrel sections. The carrel sections created eight individual carrels, or one per subject. A Craig Model 8133 audio tape cassette recorder was used for playback purposes. In order to insure the optimum listening conditions, headsets were used for the individuals receiving the treatment. Eight Telex, Model 610-1 headsets were connected to the tape recorder via an Audiotronics PB-1 eight output jack box.

The subjects received the treatment according to a pre-planned schedule which enabled the treatment to be completed within the same school day. The schedule was developed according to the subjects' class schedule and the varying rates of speech compression. No more than eight subjects and no less than three subjects received the treatment at one given time.

The subjects were told how to use their headsets through the examiner's demonstration and then were asked to put on their headsets and listen to the tape recording. After receiving the treatment, the subjects were given an answer sheet (see Appendix C) for the comprehension test. The subjects were then read a set of directions and the comprehension test questions by the examiner. The directions and test questions can be found in Appendix C. Time was allowed for

students to answer each question before proceeding onto the succeeding questions. Upon the completion of the test, the answer sheets were collected from each of the subjects. The procedures were repeated for each of the subject groups according to their speech compression rate.

Testable Hypotheses

In order to test the listening comprehension of primary grade children as a function of word rate and reading achievement level, three statistical hypotheses were generated and tested.

Null Hypothesis I--There will be no difference between the mean score, as measured by a multiple choice comprehension test, for primary grade students at each reading achievement level as the word rate for the narrative passage is increased.

Alternate Hypothesis I--The mean score on a listening comprehension test for primary grade students at each reading achievement level will decrease as the word rate for the narrative passage is increased.

Null Hypothesis II--There will be no difference between the mean score, as measured by a multiple choice comprehension test, for primary grade students at the higher reading achievement level and the mean score as measured by the same multiple choice comprehension test for students at the lower reading achievement levels at each word rate.

Alternate Hypothesis II--The mean score on a listening comprehension test for primary grade students at the higher reading achievement level will be greater than the mean score on the same listening comprehension test for students at the lower reading achievement levels at each of the word rates.

Null Hypothesis III--There will be no interaction between the reading achievement level and the word rate.

Alternate Hypothesis III--An interaction effect will result between the reading achievement level and the word rate.

Design and Analysis

After determining the subjects' reading achievement level, the 120 subjects were randomly assigned to the four speech compression treatment groups and a control group for each of the reading achievement levels. Although the control group was not necessary for the hypotheses stated in this study, it did serve as a comparison group with reference to the listening comprehension test. This group of 24 subjects did not listen to the narrative passage but were given the comprehension test for the narrative passage.

In order to investigate the comprehension of a narrative passage by primary school children as a function of listening rate and reading achievement level, an analysis of variance was employed. The design is illustrated in Table 3. This design enables one to "determine whether the amount of variability in one set of data is significantly larger than the variability in another."[15]

In this study, the two way analysis of variance will compare the factor of word rate with the factor of reading achievement level. Each cell within this design contains an equal number of subjects, eight. The treatment groups

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[15]Freeman F. Elzey, A First Reader in Statistics (Belmont, California: Wadsworth Publishing Company, Inc., 1967), p. 49.

Table 3

TWO WAY ANALYSIS OF VARIANCE

Factor A (Word Rate In Percent)	Factor B (Reading Achievement Level in Grade Equivalency)		
	Low 1.0-1.9	Middle 2.0-2.9	High 3.0-3.9
0% Compression	8	8	8
20% Compression	8	8	8
40% Compression	8	8	8
60% Compression	8	8	8
			N=96

listened to the narrative passage at the word rates or speech compressions illustrated in Table 2 and then received a comprehension test for the narrative passage. The data will indicate how the scores on the comprehension test varies with the levels of the two factors previously mentioned. In addition to determining the effect of reading comprehension achievement level and word rate, upon the dependent variable, listening comprehension scores, this study is also concerned about the interaction effect. The data will be analyzed through the use of the Control Data 3600 computer.

The level of significance for each of the three F-tests: the tests of the null hypotheses for the main effects of factor A, word rate, and factor B, reading achievement level, and of the interaction effect of factors A and B is .05.

Since the sample size within each cell is relatively small and the treatment involved a short period of time, the alpha level for rejecting the null hypotheses was established at the .05 level.

Summary

A sample population of 96 primary grade subjects were randomly assigned to the twelve treatment groups according to their reading achievement levels. The twelve treatment groups were classified as low, middle, and high reading achievement, based upon grade equivalency scores from the Stanford Achievement Test, and word rate levels of 0, 20, 40, and 60 percent compression. Each treatment group consisted of eight subjects.

Each subject was presented with a set of directions and a narrative passage through the use of audio tape prepared by a professional reader. Upon the completion of the listening task, the subjects were given a multiple choice comprehension test for the narrative passage. The test questions and the possible responses were read to the subjects. These tests were scored and a raw score, the number of correct responses out of 12 questions, was compiled for each subject.

A two way analysis of variance was employed in order to determine the main effect of word rate and reading achievement level. An interaction effect between the two factors was also tested in the design. A significance level of .05 was selected for the study.

CHAPTER IV

ANALYSIS OF RESULTS

A two way analysis of variance was used to test the main effect hypotheses and the hypothesis relating to the interaction effect. The factors in the design were word rate and reading achievement level. The word rate factor contained four levels and the reading achievement factor contained three levels. The raw scores on the listening comprehension test were the dependent variable in the analysis. The raw scores were the total number of correct responses out of twelve possible correct responses. The three hypotheses were tested at the .05 alpha level.

Results

An analysis of variance was employed to determine the effects of word rate and reading comprehension achievement level on listening comprehension. The interaction between word rate and reading comprehension achievement level was also analyzed. A summary of the results is contained within Table 4. In order to present the results in an organized, concise manner, each of the testable hypotheses will be individually analyzed.

Table 4

ANALYSIS OF VARIANCE FOR LISTENING COMPREHENSION SCORES

Source of Variation	D.f.	Mean Squares	F-Value	p
Between Word Rate	3	33.2917	6.8207	0.004
Between Reading Level	2	19.3854	3.9716	0.0225
Interaction	6	3.8854	0.7960	0.5757

Word Rate

The testable hypothesis for the main effect of word rate was as follows:

> Null Hypothesis I--There will be no difference between the mean score, as measured by a multiple choice comprehension test for primary grade students at each reading achievement level as the word rate for the narrative passage is increased.

The analysis of variance produced an F-value of 6.8207 for the main effect of word rate which is significant at the .05 level of confidence. Therefore, the null hypothesis is rejected. The mean scores for students listening at the slower word rates were greater than the mean scores for those subjects listening to the narrative passage at faster word rates. The mean listening comprehension test scores for each word rate level are presented in Table 5.

Table 5

MEAN LISTENING COMPREHENSION SCORES FOR EACH WORD RATE

Word Rate	N	Mean
0% Compression (138 wpm)	24	10.625
20% Compression (173 wpm)	24	10.333
40% Compression (230 wpm)	24	9.208
60% Compression (345 wpm)	24	8.000

Reading Comprehension Level

The testable hypothesis for the main effect of reading achievement level was as follows:

> Null Hypothesis II--There will be no difference between the mean score, as measured by a multiple choice comprehension test, for primary grade students at the higher reading achievement level and the mean score as measured by the same multiple choice comprehension test for students at the lower reading achievement levels at each word rate.

The analysis of variance generated an F-value of 3.9716 for the main effect of reading comprehension achievement level which was also significant at the .05 level of confidence. Therefore, the null hypothesis for the main effect of reading comprehension achievement level is rejected. The mean scores for subjects having a higher reading comprehension achievement level were greater than the mean scores on the listening comprehension test for those subjects at the lower reading comprehension achievement levels.

Table 6 contains the listening comprehension test scores for each reading achievement level.

Table 6

MEAN LISTENING COMPREHENSION SCORES FOR EACH READING ACHIEVEMENT LEVEL

Reading Achievement Level (In grade equivalency)	N	Mean
High (3.0-3.9)	32	10.031
Middle (2.0-2.9)	32	9.906
Low (1.0-1.9)	32	8.625

Interaction

The hypothesis for the interaction effect between word rate and reading achievement level was as follows:

Null Hypothesis III--There will be no interaction between reading achievement level and the word rate.

The analysis of variance produced an F-value of 0.7960 for the interaction effect between reading achievement and word rate which was not significant at the .05 level of confidence. The null hypothesis, therefore, was not rejected. The mean scores (see Table 7) for the three levels of the independent variable, reading achievement, and the four levels of the independent variable, word rate, illustrate the effects between each independent variable. If the effects between the

Table 7

MEAN SCORES FOR THE TREATMENT GROUPS

	Factor B: Reading Achievement Level (In Grade Equivalency)			
Factor A: Word Rate (In Percent)	Low (1.0-1.9)	Middle (2.0-2.9)	High (3.0-3.9)	
0% Compression	$\bar{X}$=9.750	$\bar{X}$=11.625	$\bar{X}$=10.500	$\bar{X}$=10.625
20% Compression	$\bar{X}$=8.500	$\bar{X}$=10.750	$\bar{X}$=11.500	$\bar{X}$=10.333
40% Compression	$\bar{X}$=8.625	$\bar{X}$=9.500	$\bar{X}$=9.500	$\bar{X}$=9.208
60% Compression	$\bar{X}$=7.625	$\bar{X}$=7.750	$\bar{X}$=8.625	$\bar{X}$=8.000
	$\bar{X}$=8.625	$\bar{X}$=9.906	$\bar{X}$=10.031	

two independent variables are the same, an interaction between those independent variables does not exist according to Glass and Stanley.[1]

Further Analyses

In addition to testing the main effect hypotheses and the interaction effect hypothesis using the two way analysis of variance, additional independent variables were considered. In testing the additional independent variables, a one way analysis of variance was used.

Sex

As previously stated, Orr, Friedman, and Williams[2] indicated that the listener's sex did not cause differences in listening comprehension involving compressed speech. This variable was tested within this study using the one way ANOVA. The F-value was 0.21319 which was not significant at the .05 confidence level. These results support those mentioned above.

Academic Grade Level

The independent variable of the students' academic

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[1]Gene V. Glass and Julian C. Stanley, Statistical Methods in Education and Psychology (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), p. 406.

[2]D. B. Orr, H. L. Friedman, and Jane C. Williams, "Trainability of Listening Comprehension of Speeded Discourse." Journal of Educational Psychology, LVI (June, 1965), pp. 148-56.

grade level was tested through the use of a one way ANOVA. The F-value was 3.74854 which was significant at the .05 confidence level. These results are supportive of the findings of Wood[3] and Fergen.[4]

National Origin

Although previous studies have not dealt with one's national origin, regional locations, or cultural backgrounds, the percentage of foreign students (23%) involved in this study dictated that a one way ANOVA be conducted.

The independent variable was student origin, being either from a foreign country or from the United States of America. An F-value of 0.28963 was reported which indicated that national origin was not significant at the .05 level of confidence. In analyzing the mean scores for foreign students and U.S.A. students, it was found that the mean score for the foreign students was 9.2727 and the mean score for U.S.A. students was 9.5946. The grand mean score for the 96 subjects was 9.5208.

Discussion

Although listening comprehension declines as word rate is increased for each reading achievement level (see Figure

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[3]David C. Wood, "Comprehension of Compressed Speech by Elementary School Children." Dissertation Abstracts, XXVII (July, 1966), p. 336-A.

[4]Katherine Fergen, "Listening Comprehension at Controlled Rates for Children in Grades IV, V, and VI." Dissertation Abstracts, XV (January, 1955), p. 89.

2), it may be beneficial to look at speech compression with reference to listening efficiency. Woodcock and Clark[5] developed an index for measuring learning efficiency. Their learning efficiency index is used to analyze test scores with respect to the amount of learning per unit of learning time. As previously stated, the control group is not a function of the major hypotheses, however this "test only" group is useful for making comparisons. It is also necessary for determining the learning efficiency index. The learning efficiency index is as follows:

$$\text{Learning Efficiency Index} = \frac{\text{Treatment Mean-"Test Only" Mean}}{\text{Listening Time in Minutes}}$$

Figure 3 illustrates the Learning Efficiency Indexes for the listening comprehension data resulting from this study.

The mean scores for each treatment group would indicate that the lower rates of compression appear better than the higher rates of compression. However, the rate of 40 percent compression would appear best when considering learning efficiency, especially for the low reading achievement level.

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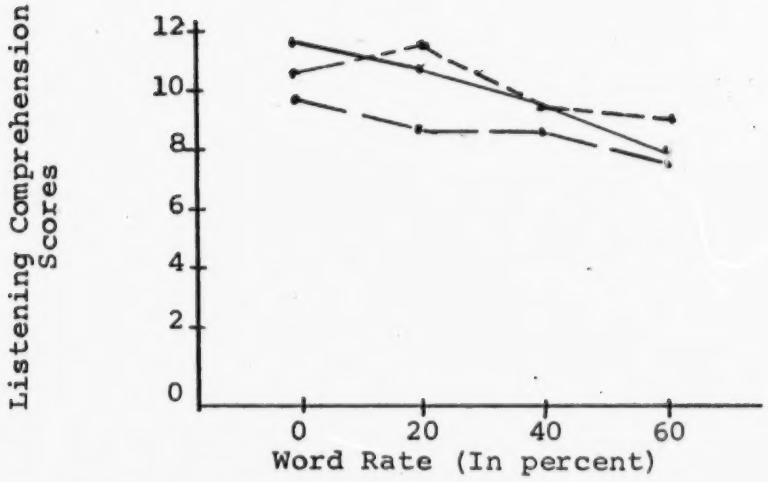
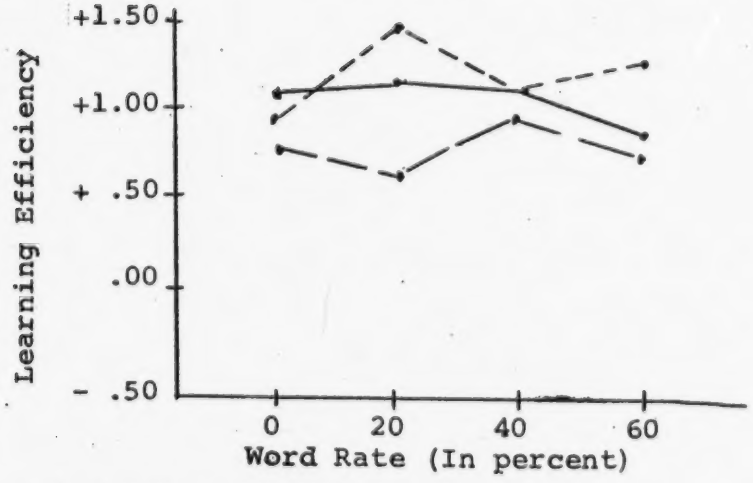
[5]Richard W. Woodcock and Charlotte R. Clark, "Comprehension of a Narrative Passage by Elementary School Children as a Function of Listening Rate, Retention Period, and IQ." Journal of Communication, XVIII (September, 1968), p. 270.



----- High Reading Achievement Level
——— Middle Reading Achievement Level
– – – Low Reading Achievement Level

Figure 2. Mean scores for listening comprehension.



----- High Reading Achievement Level
——— Middle Reading Achievement Level
– – – Low Reading Achievement Level

Figure 3. Learning efficiency index.

Summary

The hypotheses for the main effect and the hypothesis for the interaction effect were tested through the use of a two way analysis of variance. The .05 level of confidence was used to test the three major hypotheses for significance. A summary of the results can be found in Table 8. Independent variables, such as sex, academic grade level, and national origin were also analyzed. The use of a one way analysis of variance was employed for each of those variables.

Table 8

SUMMARY OF RESULTS

Null Hypotheses	Statement of Rejection or Non-Rejection
I. There will be no difference between the mean score, as measured by a multiple choice comprehension test, for primary grade students at each reading achievement level as the word rate for the narrative passage is increased.	* Rejection
II. There will be no difference between the mean score, as measured by a multiple choice comprehension test, for primary grade students at the higher reading achievement level and the mean score as measured by the same multiple choice comprehension test for students at the lower reading achievement levels at each word rate.	* Rejection
III. There will be no interaction between the reading achievement level and the word rate.	Non-Rejection

* Significant at the .05 level.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The purpose of this study was to examine the difference in listening comprehension for primary grade children who listened to a narrative passage compressed at four different word rates. Reading achievement level was also evaluated in order to determine if it could be used as a predictor variable for the comprehension of compressed speech.

Studies relating to listening comprehension as a function of word rate have been conducted as early as 1940, however, the major portion of these studies have been conducted only within the past decade. It was during this time that methods of altering word rate were improved, such as the mechanical sampling method for compressing speech. Past studies have also indicated that listening is not significantly affected until word rates reach or exceed 60 percent of the original time.

Various studies have attempted to predict an individual's listening comprehension of compressed speech. Disagreement has resulted among many researchers using predictors such as sex, intelligence, or type of material. Some have found that

a student's achievement level can be used as a predictor for listening comprehension of compressed speech.

In order to test the comprehension of a narrative passage by primary grade children as a function of listening rate and reading comprehension level, a sample population of 96 primary grade subjects were randomly assigned to the twelve treatment groups according to their reading comprehension achievement levels. The subjects were classified according to low, middle, and high reading achievement abilities based upon the grade equivalency scores for the reading section of the Stanford Achievement Test; and the four levels of word rate, 0, 20, 40, and 60 percent compression. Each of the eight subjects within the twelve treatment groups listened to a set of directions and the narrative passage recorded on audio tape. The directions were divided into three parts with the second part serving as a familiarization passage. The familiarization passage within the directions was compressed the same amount of time as was the narrative passage to which the subject was to listen.

The story of Johnny Appleseed served as the narrative passage for the study. The narrative passage was originally recorded at 138 words per minute. In addition to the 0 percent compression word rate, the passage was compressed to 173, 230, and 345 wpm. This particular narrative passage was selected because of its favorable rating on the Flesch Readability Index. After listening to the narrative passage,

the subjects were given a comprehension test. The comprehension tests were scored and the scores were then compiled.

A two way analysis of variance was employed in order to determine the main effect of word rate and reading achievement level. An interaction effect between the two factors was also tested. The .05 level of confidence was used to test the three major hypotheses for significance.

Conclusions

The analysis of the data concerning the comprehension scores of the narrative passage supports the following conclusions:

1. Listening comprehension of a narrative passage will decline as the speech is compressed or the listening rate is increased. The amount of decline from 0 to 20 percent compression is evident but to a much lesser degree than the decline from 20 percent and above. The decline in comprehension noticeably begins at the 40 percent level of compression and continues to drop drastically at the 60 percent level of compression.

2. Individuals reading at a third grade reading achievement level will score higher in a listening comprehension test for a narrative passage than will students at a second grade reading achievement level. The students at the second grade reading achievement level will score higher in a listening comprehension test for a narrative passage than will students at the first grade reading achievement level.

3. The analysis did not indicate interaction between the three levels of reading achievement level and the four levels of word rate as determined by the listening comprehension test scores for the narrative passage. A slight deviation in test scores existed at the 0 percent comprehension level for middle reading achievement level subjects but this was not significant for interaction.

Discussion of Results

As indicated by Hollingsworth,[1] the relationship between reading and listening is similar in that both processes require the receiver to organize the spoken language and the perception of word meanings are necessary for comprehension. Although much of the literature indicates that listening is superior to reading for children in the primary grades, the children who were at higher reading achievement levels scored higher on the listening comprehension test than did those at the lower reading achievement levels. This would lead one to believe that the relationship between reading and listening is stronger than some experts are willing to admit.

If the first grade student is a better listener than reader, as stated by Ducker,[2] then it would be expected that

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[1]Paul M. Hollingsworth, "Can Training in Listening Improve Reading?" In Reading Instruction, ed. by William K. Durr (Boston: Houghton Mifflin Co., 1967), p. 139.

[2]Sam Ducker, "Listening and Reading." The Elementary School Journal, LXV (March, 1965), p. 327.

some interaction would result between the word rate levels and the reading achievement levels, especially for the low (1.0-1.9 grade equivalency) reading achievement level. However, the data did not support an interaction effect in this study. An analysis of the subjects academic grade level revealed that the listening comprehension was greater for those in the second, third, and first grades respectively.

The results of the investigation concerning word rate tends to support previous studies. There was little difference between listening comprehension at rates of 0 and 20 percent compression, however, the decline in listening comprehension at 40 percent compression for the middle and high reading achievement levels was not supportive of previous research. Previous research indicates that the drastic decline in listening comprehension would take place at the 60 percent compression rate.

Recommendations

The following recommendations are based on the findings of this study and the experiences associated with this study.

1. The subjects' exposure to compressed speech during the treatment was very limited. Some of the subjects, particularly those listening to the faster word rates, appeared to be less serious than those who listened to the narrative passage at the slower rates of compression.

Proportionate increases in the length of the narrative passage and the directions to the listener may eliminate this problem, but one must be aware of the attention span for students within the primary grade level. It may be more beneficial to design another treatment session for this study.

2. A great amount of difficulty exists in constructing an adequate measure of listening comprehension for the primary grade children. The Perceptual Alternatives Laboratory at the University of Louisville could not provide comprehension test materials suitable for use with primary grade children according to Emerson Foulke.[3] A cloze test could be developed to measure comprehension. According to Orr,[4] this type of test is gaining prominence in measuring comprehension. Comparing the cloze test with the present test is suggested for future research of compressed speech.

3. As previously indicated, training has an affect upon listening comprehension of compressed speech. It has also been stated that compressed speech may serve as an alternate strategy for instruction. However, this study would imply that compressed speech may only be effectively

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[3]Emerson Foulke, Audio tape Correspondence, Perceptual Alternatives Laboratory (University of Louisville, Louisville, Kentucky, January 4, 1972).

[4]David B. Orr, "The Measurement of Listening Comprehension," in Proceedings of the Second Conference on Rate and/or Frequency Controlled Speech, ed. by Emerson Foulke (Louisville: Center for Rate Controlled Recordings, 1969), p. 221.

used at the lower rates of compression and not for those students in the lower reading achievement level. Before compressed speech becomes an alternate strategy for instruction, it may be necessary to train students in listening comprehension of compressed speech much as they are trained to improve their reading comprehension. Following a number of training sessions, a replication of the present study might reveal supportive gains in listening comprehension for the levels of word rate and reading achievement.

4. Finally, the area of learning styles might be worthwhile to consider in regard to listening comprehension of compressed speech. Comparing listening comprehension scores for students having auditory preference and a high reading achievement level with the listening comprehension scores for students having visual preference and high reading achievement would be another area worthy of future research.

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APPENDICES

APPENDIX A

DIRECTIONS AND NARRATIVE PASSAGE OF JOHNNY APPLESEED

INTRODUCTION

Part 1: "Now that you have your earphones or headsets on, I will talk for a while so that you can turn up the sound if you need to turn it up. Please raise your hand if you can hear me well." (Pause) "You will listen to a story and the voice may sound different. It will sound like this ..."

Part 2: "Listen closely because you will be asked some questions about the story. You will be asked the questions after you have listened to the story. At first you will think the voice sounds different than you usually hear. It is supposed to sound like this so you should listen as best you can."

Part 3: "That may have sounded strange to you. Now you will listen to a story and you should listen closely because you will be asked some questions after you have listened to that story. The voice may sound different than usual but it is supposed to sound that way. Listen to the story and answer the questions as best you can. Listen carefully.

JOHNNY APPLESEED

Once there was a young man named Johnny Appleseed, who watched men working in a cider mill. Cider was being made from apples. When the cider was made, the men threw all the apple seeds away.

Young Johnny decided that he would pick up the seeds that the men threw away.

One day he took the many seeds that he had picked up and put them in a big sack.

Johnny knew there were no apple trees in the West.

"The people out there in the West would like to have apple trees," thought Johnny.

He decided that he would go west to plant the apple seeds.

With a sack on his back and a tin pan on his head, Johnny started west. He wore the tin pan for a hat. He wore it every day, but when the time came to eat, he made his supper in it.

When he came to a river, he stopped.

"Seeds like ground near a river," he thought. "I will plant apple seeds in the ground near the water."

And he planted seeds.

Often he saw mountain lions prowling through the forest.

On he went, down through the green valleys and up over the hills.

When he came to a farm in the valley, he threw his sack from his back and started to work.

He planted seeds for the farmer.

"Water the seeds well," Johnny said to the farmer. "Make a small fort out of the branches of the pine tree. Set a small fort around each seed until a young green shoot comes through the ground. Leave the fort standing. If you leave the fort standing until the little tree is as high as a boy, one day you will have big apple trees."

"It will be a fine thing to have apple trees on this farm," the farmer said.

"One day you will have big trees to shade those who stop to rest under the green branches. In the springtime pink and white blossoms will make your trees beautiful," Johnny said. "And in the fall you will have red apples to eat."

Then Johnny went on his way.

"There goes Johnny Appleseed," the farmer said. "He planted seeds that other men threw away."

And the farmer set a little fort of pine branches around the place where each seed was planted, and he watered the ground well.

When Johnny planted all the seeds that were in his sack, he went back to the cider mill to get more seeds.

Again he went west.

Many times he went back and forth--back and forth--from cider mill to farms, from farms to cider mill.

Johnny didn't care what he wore. Often he wore a coat that was too big and pants that were too small. He sometimes wore one boot and one shoe. At other times he wore no boots or shoes.

Sometimes he rode a horse.

More often he walked, carrying his sack against his back.

When he walked, he heard the call of the coyote and saw snakes crawling over the ground near the river.

After a while all the farmers in the West knew Johnny Appleseed, who followed his own path back and forth--back and forth.

"Here comes Johnny Appleseed," the farmer said. "He plants seeds near the river and on the farms. He plants the seeds that other men threw away."

Everywhere, Johnny found friends.

On the farms, the farmers were his friends.

In the forest, the Indians were his friends.

And he was not afraid of mountain lions or bears, wild hogs or snakes.

And in the West there were apple trees where there had been no apple trees before, because strange young Johnny planted the seeds.

APPENDIX B

THE FLESCH READABILITY FORMULA

READING EASE

Reading Ease =206.835-.846(word length)-1.015(sentence length)
=206.835-.846(118.3)-1.015(8.33)
=206.835-100.082-8.455
=98.298

PATTERN OF READING EASE SCORES

Reading Ease Score	Description of Style
0 to 30	Very difficult
30 to 50	Difficult
50 to 60	Fairly difficult
60 to 70	Standard
70 to 80	Fairly easy
80 to 90	Easy
90 to 100	Very easy

HUMAN INTEREST

Human Interest =3.635(personal words)+.314(personal sentences)
=3.635(13.5)+.314(2.83)
=48.0725+.8886
=48.96

PATTERN OF HUMAN INTEREST SCORES

Human Interest Score	Description of Style
0 to 10	Dull
10 to 20	Mildly Interesting
20 to 40	Interesting
40 to 60	Highly Interesting
60 to 100	Dramatic

APPENDIX C

LISTENING COMPREHENSION TEST MATERIALS

LISTENING COMPREHENSION QUESTIONS

I would like to ask you some questions about the story you have just heard. I will ask you a question and you will then circle the one picture which is the best answer for each question. Let's look at example A at the top of the answer sheet. Who watched the men working? If it was the farmer, circle the first picture. If it was Johnny Appleseed, circle the middle picture. If it was the men at the mill, circle the last picture or the one on the right. Which picture did you circle? (Pause) Yes, it was Johnny Appleseed or the middle picture in example A. You should have circled the picture of Johnny Appleseed. Are there any questions before we begin with the other questions? (Pause and clarify any questions the children may have which are not directly related to the story.) There will be no talking while the questions are being asked. Let's begin.

1. Who threw the seeds away? Was it
   the farmer?
   Johnny Appleseed?
   the men at the mill?
2. Who picked up the seeds? Was it
   the farmer?
   Johnny Appleseed?
   the men at the mill?

3. Who lived on farms in the valley? Was it
   the farmer?
   Johnny Appleseed?
   the men at the mill?
4. Who put seeds in a sack? Was it
   the farmer?
   Johnny Appleseed?
   the men at the mill?
5. Who went from cider mill to farm? Was it
   the farmer?
   Johnny Appleseed?
   the men at the mill?
6. Who lived in the West? Was it
   the farmer?
   Johnny Appleseed?
   the men at the mill?

I will now ask you some questions about things Johnny Appleseed saw, heard, or wore. You will circle the one picture which is the best answer for each question. Let's look at example B on your answer sheet. Did Johnny Appleseed wear a tin pan on his head, an Indian headdress, or a cap? If he wore a tin pan, circle the picture of the tin pan. If he wore an Indian headdress, circle the middle picture. If he wore a cap, circle the picture of the cap. Which picture did you circle? (Pause) Yes, he wore a tin pan on his head or the first picture in example B. You should have circled

the picture of the tin pan. Are there any questions before we begin? (Pause and clarify any questions the children may have which are not directly related to the story.) There will be no talking while the questions are being asked. Let's begin.

1. Did Johnny Appleseed see
   a bear?
   a fish?
   a monkey?
2. Did Johnny Appleseed see
   a kitten?
   a puppy?
   a snake crawling?
3. Did Johnny Appleseed hear
   a snake crawling?
   a coyote call?
   a puppy?
4. Did Johnny Appleseed hear
   a kitten?
   a mountain lion prowling?
   an Indian drum?
5. Did Johnny Appleseed wear
   tennis shoes?
   a straw hat?
   pants that were too small?

6. Did Johnny Appleseed wear

a rain coat?

a sack on his back?

a cowboy hat?

Compression _____ Number _____

ANSWER SHEET

Example A

the farmer

Johnny Appleseed

men at the mill

1.

the farmer

Johnny Appleseed

men at the mill

2.

the farmer

Johnny Appleseed

men at the mill

3.

the farmer

Johnny Appleseed

men at the mill

4.

the farmer

Johnny Appleseed

men at the mill

5.

the farmer

Johnny Appleseed

men at the mill

6.

the farmer

Johnny Appleseed

men at the mill

Example B

a tin pan

an Indian headdress

a cap

1.

a bear

a fish

a monkey

2.

a kitten

a puppy

a snake crawling

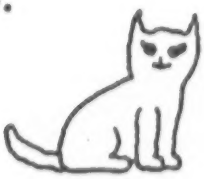
3.

a snake crawling

coyote call

a puppy

4.



a kitten

mountain lion prowling

an Indian drum

5.

tennis shoes

a straw hat

pants that were too small

6.

a rain coat

a sack on his back

a cowboy hat

APPENDIX D

SPEECH COMPRESSION RATES FOR THE NARRATIVE PASSAGE

HIGH READING ACHIEVEMENT LEVEL (3.0-3.9)

	Student Number	Reading Level	Raw Score
	326	3.0	10
	300	3.6	5
	329	3.7	12
0%	327	3.0	11
Compression	318	3.1	11
	316	3.0	12
	305	3.4	11
	304	3.9	12
	301	3.6	10
	313	3.5	11
	306	3.2	12
20%	325	3.9	12
Compression	308	3.9	12
	330	3.0	12
	310	3.9	11
	309	3.0	12

HIGH READING ACHIEVEMENT LEVEL (3.0-3.9) cont'd

	Student Number	Reading Level	Raw Score
	317	3.3	9
	302	3.3	9
	315	3.0	7
40%	324	3.0	11
Compression	311	3.6	12
	321	3.4	8
	307	3.8	10
	323	3.4	10
	320	3.4	11
	332	3.8	6
	314	3.9	7
60%	322	3.9	12
Compression	331	3.6	11
	312	3.2	8
	319	3.1	3
	303	3.1	11

MIDDLE READING ACHIEVEMENT LEVEL (2.0-2.9)

	Student Number	Reading Level	Raw Score
	245	2.6	12
	200	2.8	11
	202	2.2	12
0%	220	2.8	12
Compression	242	2.0	12
	232	2.2	11
	212	2.7	11
	228	2.7	12
	235	2.5	11
	231	2.5	12
	241	2.1	9
20%	216	2.9	11
Compression	223	2.7	8
	237	2.1	11
	238	2.6	12
	222	2.9	12

MIDDLE READING ACHIEVEMENT LEVEL (2.0-2.9) cont'd

	Student Number	Reading Level	Raw Score
	229	2.3	12
	204	2.0	12
	209	2.2	9
40%	203	2.3	8
Compression	234	2.6	12
	213	2.0	8
	239	2.1	10
	208	2.2	5
	205	2.0	8
	233	2.4	6
	210	2.5	8
60%	207	2.4	6
Compression	215	2.4	6
	211	2.5	11
	243	2.5	11
	218	2.6	6

LOW READING ACHIEVEMENT LEVEL (1.0-1.9)

	Student Number	Reading Level	Raw Score
	131	1.7	8
	107	1.5	12
	111	1.9	12
0%	109	1.2	5
Compression	103	1.9	12
	101	1.9	11
	114	1.9	8
	128	1.7	10
	126	1.8	10
	117	1.9	7
	105	1.8	10
20%	129	1.9	11
Compression	123	1.4	8
	136	1.2	6
	132	1.7	6
	121	1.4	10

LOW READING ACHIEVEMENT LEVEL (1.0-1.9) cont'd

	Student Number	Reading Level	Raw Score
	104	1.9	7
	102	1.9	12
	122	1.4	7
40%	113	1.8	8
Compression	100	1.6	12
	119	1.4	3
	115	1.4	8
	120	1.8	12
	127	1.6	11
	110	1.7	5
	134	1.8	11
60%	106	1.3	6
Compression	108	1.9	8
	135	1.6	5
	116	1.6	8
	112	1.8	7